JOINT MPH PROGRAM

ADDIS CONTINENTAL INSTITUTE OF PUPLIC HEALTH

&

UNIVERSITY OF GONDER

ASSESSMENT OF KNOWLEDGE, PRACTICE AND DETERMINANTS OF INFECTION PREVENTION AND CONTROL FOCUSING ON HAND HYGYIENE IN ADDIS ABABA CITY HOSPITALS, ETHIOPIA

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A THESIS SUBMITTED TO THE SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF GONDER, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER'S IN PUBLIC HEALTH

June 30, 2009

Addis Ababa, Ethiopia

ABBREVIATIONS

AAU	Addis Ababa University
ACIPH	Addis Continental Institute of Public Health
AIDS	Acquired Immune Deficiency Syndrome
ARHB	Addis Ababa Regional Health Bureau
BSI	Body Substance Isolation
CDC	Center for Disease Control and Prevention
CI	Confidence Interval
FGD	Focus Group Discussion
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
IP	Infection Prevention
KAP	Knowledge, Attitude and Practice
MPH	Master of Public Health
MoH	Ministry of Health
MRSA	Methicillin-Resistant Staphylococci
OPD	Out Patient Department
PEP	Post Exposure Prophylaxis
PPE	Personal Protective Equipment
SNNPR	Southern Nation Nationalities and People Region
UoG	University of Gondar
UP	Universal Precautions
WHO	World Health Organization

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ABSTRACT

Background: Hand hygiene significantly reduces the number of disease contamination and can minimize cross- contamination. But in daily practice compliance to hand hygiene is low and reasons for low compliance, factors associated had not been well defined in Ethiopia, probably due to limitation of studies.

Objectives: The Main objective of the study was to assess the infection prevention and control activities of healthcare workers focusing on hand hygiene.

Methods: Cross-sectional quantitative study design and qualitative individual in-depth interview were conducted. Semi-structured open-ended questions were employed. 628 participants completed a self administered questionnaire. 17 key hospital informants selected purposively and interviewed.

Results: Level of health institution, gender profession and program management efforts of infection prevention & control were found to be independent predictor of hand hygiene practice. The mean knowledge score of health care workers was 4.94 (1.381). 56.5% (355) of the respondents suggested that the infection prevention and control program management effort of the health facilities was unsatisfactory. It was statistically significant (OR = 0.89, 95% CI = (0.92-0.83), (Adjusted OR = 1.63, 95% CI = 1.15-2.31), P = 0.05 and associated with hand hygiene practice. In addition, lack of budget, commitment, training opportunities, knowledge, supplies and hand washing facilities were reported as the main reasons for poor hand hygiene performance.

Conclusion: The finding they a substantial proportion of the facilities surveyed lack proper infection prevention hand hygiene practice. Facilities have made some efforts, but much more needs to be done to respond successfully to a serious communicable disease with serious consequences. An effective infection prevention program management will help in the retention of knowledge, attitudes and practices among the various categories of healthcare workers. Staff training, adoption of an alcohol based hand-rub, hand washing facilities with a regular system of monitoring in place and take action to assist employers & workers in the health system are recommended.

Key words: *Hand hygiene practice, IP Program management and, Knowledge.*

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1. INTRODUCTION

Background:

Hospital infections cause prolonged hospitalization and consumption of resources as well as increased morbidity and mortality (1). Nosocomial pathogens are sometimes transmitted from patient to patient through the hands of healthcare workers (2). The pathogens on the hand can be divided into transient and resident flora (3). The transient flora appears to be the more important cause of nosocomial infections.

The hands of the health care workers are frequently contaminated by direct contact during routine patient care or while touching a contaminated surface or device. Multiple epidemics have been reported due to contaminated hands of healthcare workers. Hand hygiene is therefore considered as the most important, preventing horizontal transmission of nosocomial pathogens (4).

Nevertheless, compliance with hand washing among healthcare workers is only about 40-50%. Increased patient workload, decreased staffing, limited time, long distances to sinks, belief that use of glove obviated the need for hand hygiene and ignorance of or disagreement with guidelines, in appropriate infection prevention program management and protocol have all contributed to poor compliance with hand hygiene and other routine infection control measures, Infection control is rarely taught in medical and nursing schools, and poor hand washing practices may be learnt from peers at the bedside. (4)

In resource-poor countries, where the health system needs to deliver care to a population with lower health status and to cope with the lack of human and technical resources, the burden of health care-associated infections is even more important. As an example, in Mexico, health care-associated infections are the third most common cause of death for the entire population. Although estimates of preventable health care-associated infections vary, the proportion may be as high as 40% or more in developing countries (5).

In Ethiopia, a study done by Nigat project and Engender health showed that health care workers didn't usually wash their hands on arrival to work place and before putting on glove; even thought, it is well practiced between clients before leaving work place (6).

A study also done in North Wollo Zone, in Ethiopia revealed that the overall hand hygiene adherence rate was 28.34%. Correct hand hygiene practice had statistically significant association with availability of water, alcohol, and participating universal precautions trainings (7).

Rationale of the Study:

The study done at Felege Hiwot Referral Hospital showed that the isolation rate of Methicillin-Riesistant Staphylococci was found to be 55-78% (8). But in daily practice compliance to hand hygiene is low and the reasons for low compliance, factors associated had not yet been well defined in Ethiopia probably due to limited studies on infection prevention and control specifically on hand hygiene. Initially, all levels of healthcare workers need to know why infection prevention is important key topics to be taught should be included (9).

Therefore, the aim of this study was to assess the knowledge, practice, program management of infection prevention and determining factors for hand hygiene practice in government and private health hospitals in Addis Ababa, Ethiopia. So that, the health planners, health care workers, managers and evaluators can use the outcome of this study.

2. LITRATURE REVIEW

Hospital Acquire Infection:

Nosocomial infections are infections acquired by patients while they are in the hospital, unrelated to the condition for which the patients were hospitalized. CDC estimates that 5% to 15% of all hospital patients acquire some type of nosocomial infections. Hospital health care workers are become infected (10).

Health care-associated infections occur worldwide and affect both developed and resource-poor countries. People who provide or receive health care services- whether in a hospital, clinic or any other health care setting-are at risk of acquiring and transmitting potentially life threatening infections through accidental exposure to blood and body fluids or contaminated objects (11).

A prevalence survey conducted under the auspices of WHO in 55 hospitals of 14 countries representing four WHO regions (South-East Asia, Europe, the Eastern Mediterranean and Western Pacific) revealed that, on average, 8.7% of hospital patients suffer nosocomial infections. At any time, over 1.4 million people world-wide suffer from infectious complications associated with health care (12).

With advances in the health care system, the threat to hospital-acquired infections still remains. Hospital – acquired infections are known to result in substantial morbidity and are estimated to cause or contribute to nearly 80,000 deaths annually in the United States many nosocomial infections are caused by pathogens transmitted from one patient to another by way of health care workers (HCWs) who have not washed

their hands between patients or HCWs who do not practice control measures such as use of hand disinfection, glove use, etc. (13).

Infection Prevention & Control:

In 1985, largely because of the emergence of HIV/AIDS, guidelines for protecting healthcare workers from becoming infected with HIV and other blood borne infections (e.g. HCV) were quickly developed and became known as Universal Precautions (UP).

The CDC define *universal precaution* as: "a set of precautions designed to prevent transmission of HIV, Hepatitis B virus (HBV) and other blood borne pathogens when providing first aid or health care. Under universal precaution, blood and certain body fluids of all patients are considered infectious for HIV, HBV and other blood borne pathogens."

Almost from the moment they were issued and hospital and clinics began implementing them, it was recognized that this new strategy, while protecting hospital personnel (patient-to-personnel transmission), sacrificed some measures of preventing patient-to-patient and personnel-to-patient transmission. Also, because many people with blood borne infections such as HIV/AIDS do not have symptoms, nor can they be visibly recognized as being infected, UP had to be modified to include all persons-patients and clients attending healthcare facilities regardless of whether or not they are infected (14).

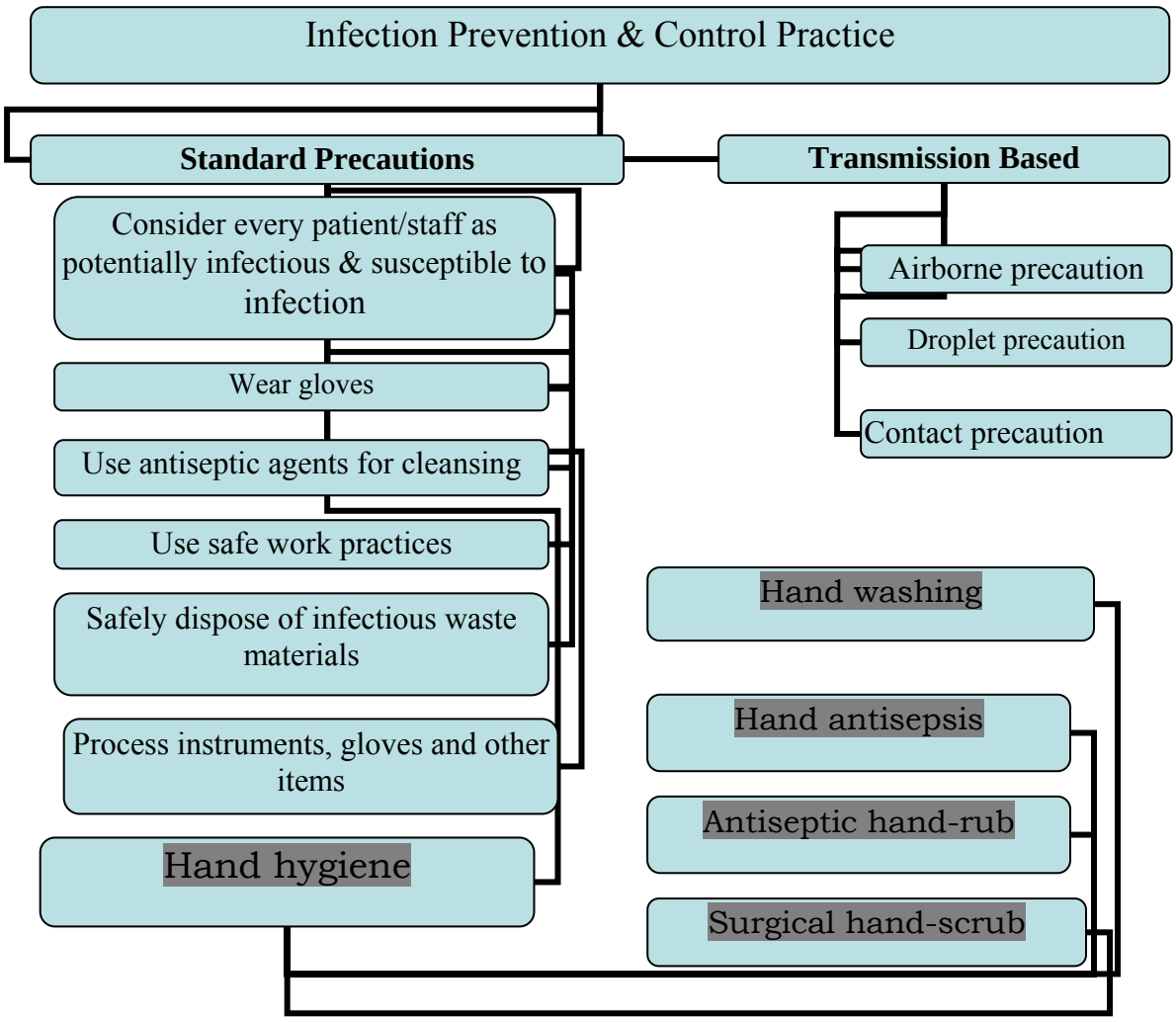
At nearly the same time that UPs were being introduced, a new system of health worker and patient precautions was proposed as and alternative to the diagnosis-

driven UP. This approach, called Body Substance Isolation (BSI), focused on protecting patients and health personnel from all most and potentially infected body substances (secretions and excretions), not just blood. BSI quickly gained acceptance over UP because it was simple, easy to learn and implement, and acknowledged that all patients, not just those diagnosed or with symptoms, may be infected and therefore not free of risk to other patients or staff. (10).

By the early 1990s healthcare facilities and staff were totally confused regarding what to do about patient and staff precaution guidelines. In view of these problems and concerns, no simple merging together of UP or BSI appeared likely to solve them. What has emerged since then is a new system that provides a single set of isolation guidelines with logistically feasible recommendations for preventing the many infections that occur in healthcare facilities through all known modes of transmission (10).

The new guidelines issued by CDC in 1996 involve a two-level approach: *Standard precautions*, which apply to all clients and patients attending health care facilities and *Transmission-based precautions*, which apply only to hospitalized patients (Fig 1,).

Figure 2: The new guidelines issued by CDC in 1996 involve a two-level Infection Prevention approach key components:



Hand hygiene:

Hand hygiene is one of the most important components of standard precautions which can be accomplished by routine hand washing (with or without antiseptic agent) or antiseptic hand-rub and surgical hand-scrub using a waterless, alcohol-based antiseptic agent. The purpose and way to do each differs slightly. Hand hygiene is the single most effective infection-control behavior that stops the spread of infection (15).

Although Semmelweis demonstrated more than a century ago that hand washing itself was sufficient in reducing the incidence of nosocomial infections, compliance of

HCWs with the recommended hand washing practices remains in most cases < 50%. Even the spread of multi-drug resistant pathogens has not compelled HCWs to adopt recommended practices. (16)

The purpose of hand washing which is an important component of hand hygiene is that to mechanically remove soil and debris from the skin and reduce the number of transient microorganism. Hand washing should be done before: examining a patient, putting on sterile or high-level disinfected surgical gloves prior to an operation, or examination gloves for routine procedures such as a pelvic examination and after any situation in which hands may become contaminated, such as: handling soiled instruments and other items; touching mucous membranes; blood or other body fluids; having prolonged and intense contact with a patient; and removing gloves (10).

In order to overcome the compliance problem alternative hand hygiene methods have been developed. During routine patient care, hand rubbing with alcohol based solution is found to be more effective in reducing contamination than hand washing with antiseptic soap (17).

The United States Centers of Disease Control and Prevention (CDC) guidelines recommend for health care workers are: when skin is damaged or frequent hand washing is required, a mild soap (without antiseptic agent) should be used to remove soil and debris. If antimicrobial action is desired and hands not visibly dirty, an antiseptic hand-rub should be used rather than washing hands with medicated antiseptic soap. In high-risk areas such as the operating room, neonatal ICU or transplant units, hand scrub protocols that use soft brushes or sponges for a shorter time (at least 2 minutes) should replace harsh scrubbing with hard brushes for 6-10

minutes. For staff who frequently wash their hands, hand lotions and creams should be provided in order to reduce irritation of the skin (18).

Infection Prevention Program Management:

Successful programs for preventing the spreads of infectious disease in healthcare facilities are based on understanding the scope of the problem, prioritizing activities and effectively using available resources. Initially, all levels of healthcare workers need to know why infection prevention particularly hand hygiene is important key topics to be taught should be included. To have long-term effects, the initial training should be followed up, and monitoring should be targeted toward identifying and solving specific problems related in introducing the new process or procedure (12).

Keeping records of infections that occur in hospitals and clinics is a time-honored way of monitoring the effectiveness of infection prevention practices can help to identify breaks in recommended IP practices. There should be a staff assigned to keep records or relevant information. Most of the time, the decisions and actions of healthcare staff are largely influenced by personal feelings, attitudes and beliefs, and their level of knowledge (10).

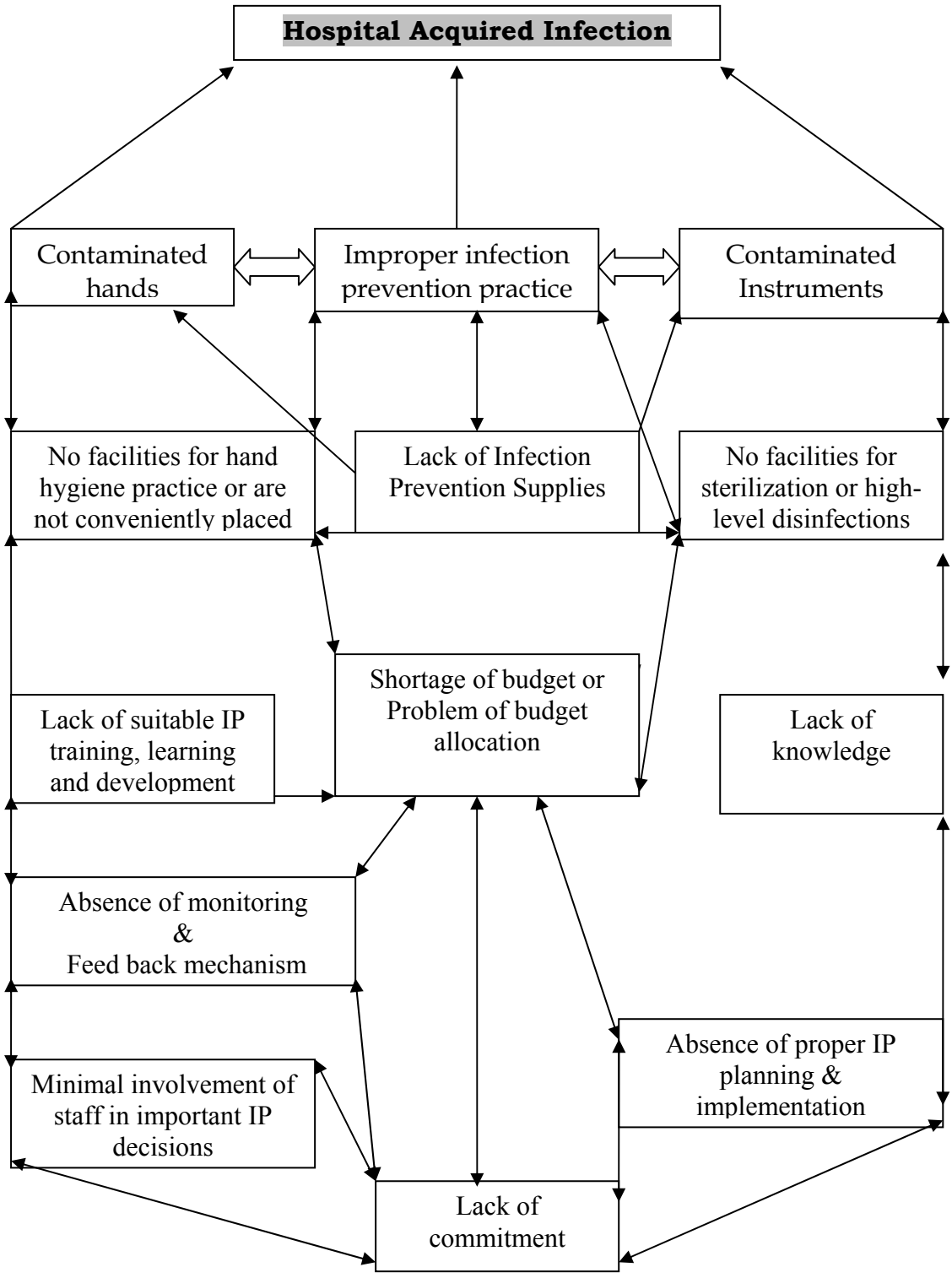
In Ethiopia, the magnitude and pattern of surgical wound infection in a teaching hospital in Gondar, northwest of the country, was studied prospectively over a one year period. Out of 129 abdominal surgical wounds from 129 patients, fifty (38.7%) yielded pathogenic organisms on culture. The wound infection rate was 21% on clinical grounds alone. Wound infection was significantly associated with class of wound; with the highest rate being 61.4% for contaminated or dirty wound (20) why?

According to the national infection prevention policy, to demonstrate accountability for quality in the area of infection control a facility infection control program should be structured, implemented and managed to (e.g. formation of infection prevention working group and its functionality) to achieve the reduction in incidence and risk of preventable health care associated infection. This is organizational framework can facilitates the effective deployment of resources which limited to deliver effective and scientifically valid manner. The guideline also recommend that an infection prevention working group should include representatives from a variety of patient areas including surgery, central sterilization department, housekeeping, laboratory, laundry, kitchen, and administration by using national IP guidelines to handle situations in which patients or staff after exposed to the risk of infection, conduct staff orientation before new polices, recommendations, or procedures are started and provide follow-up training when management reinforcement is needed, and be sure adequate supplies, equipment, facilities are available before start-up to ensure compliance (21).

A study done at Felege Hiwot Referal Hospital in North West of Ethiopia, the result showed that the isolation rate of methicillin-resistant staphylococci (MRSA and MRoNS) was found to be 55% and 78% respectively (8).

Failure to perform appropriate hand hygiene is considered to be the leading cause of nosocomial infections and the spread of multi resistant microorganisms, and has been recognized as significant contributor to outbreaks (22). So, assessing the infection prevention program management effort and the infection prevention hand hygiene practice, not only can give way to manage the limited resources but also will contribute to decrease the morbidity and morality of hospital acquire infection.

Fig. 1: Conceptual Frame-work of Infection Prevention and control in the health facilities focusing on hand hygiene practices.



3. OBJECTIVE OF THE STUDY

3.1. General objective

To assess the infection prevention and control activities of healthcare workers focusing on hand hygiene practice.

3.2. Specific objectives

- To assess the knowledge, and practices among the different health care workers for infection prevention and control.

- To identify determining factors for the practice of hand hygiene in the government and private health facilities.

- To identify the infection prevention program management (presence of guideline, training, planning, monitoring etc…) of health facilities.

4. METHODOLOGY

4.1.Quantitative method

4.1.1. Study design

The study was institutional based cross-sectional design with internal comparison and complemented by in-depth interview qualitative method.

4.1.2. Study area

The study was carried out in the government and private hospitals of Addis Ababa, the capital city of Ethiopia.

In Addis Ababa there are around ten governmental, twenty four private hospitals, twenty three health centers and nearly seven hundred different level of private clinics of different sizes *(Source: Addis Ababa Regional Health Bureau*). The study was carried out from April - May, 2009.

4.1.3. Source and study population

The source population was all health care workers actively working in health care facilities in Addis Ababa City during data collection period.

The study population was all health care workers (health care providers; physicians, health officers, nurses/midwifes, Lab. technicians, laundry personnel and

housekeeping personnel and others) from four randomly selected public and private hospitals (namely Yekatit-12, Ras Desta, Korea, Tseganeh) and actively working in health care facilities in Addis Ababa during data collection period.

All supportive staff, except housekeeping personnel and laundry workers, excluded from the study.

4.1.4. Sampling

4.1.4.1.Sample size determination

The sample size for quantitative study was calculated using a two proportions and STAT CALC IN EPI INFO.

A study done in North Wollo revealed that the level of outcome of hand hygiene knowledge/adherence in the government health institution was 28.34% (9).

To determine the sample size, it was assumed that the precision to an acceptable approximation of the population was taken to be CI of 95%, taking a degree of freedom 5%, power of 80%, odds ratio (OR) of 2, estimated level of outcome 28.3%, design effect of 2 and total sample size 312. Based on these assumptions the actual sample size of the study population was computed using two sample population proportions as the formula depicts below:

$$\textit{Comparison of two proportions let, } P = P1 + P2/1 + r$$

$$n1 = \frac{[Za/2\sqrt{(1 + 1/r)\, P(1-P)} + Z\beta\sqrt{P1(1-P1) + P2(1-P2)/r}]2}{2}$$

Since data had been collected by self administered questionnaire and a relatively high proportion of non-response rate was expected. All health care workers were included to obtain optimum sample size and 12% non-response rate was added for each site. These made the over all sample size of 689 (for gov. and private hospitals). Then, the number of subjects that was participated in the study was allocated to each private and government hospital proportionally [n = 318 (22.7%), n = 371 (33.5%) respectively].

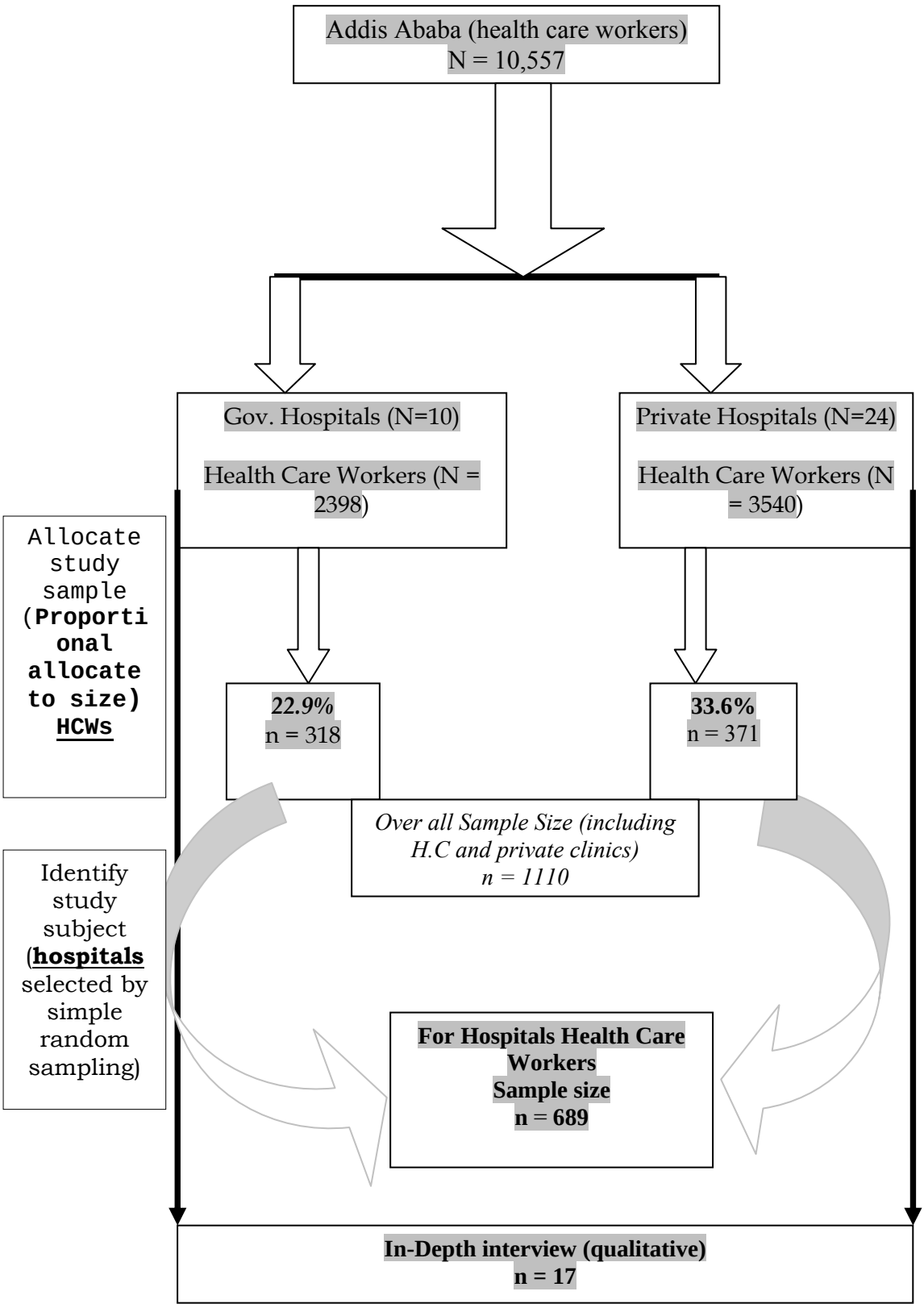
4.1.4.2.*Sampling Procedure:*

The study employed multistage sampling procedure (Figure 3). First, health facilities were stratified by type and sample was allocated proportionally to size. Second, two private and two governmental hospitals were selected randomly and then all healthcare workers were involved in the study (from the selected hospitals). The total number of health care workers allocated proportionally to size.

For individual government hospitals there sample allocated in proportion to number of health care workers they employee (obtained from regional health bureau for each hospital). Whereas, from private hospitals, same number of study subjects was selected but latter on during the time of survey the actual number obtained from their respected hospital leaders.

At the facility level sampling was done from all health care workers. The study was focused on nurses, physicians/health officers, laboratory technicians, laundry, and housekeeping personnel. The number of health care workers obtained from each of the above groups in each facility.

Figure 3: **Schematic presentation of sampling procedure May, 2009**



4.1.5. Data collection

The quantitative method involves assessment of the knowledge and practices of health care workers for infection prevention practice focusing on hand hygiene. Standardized and structured questionnaires were developed and were self administered for the purpose of data collection and some of the questionnaires adapted from earlier studies done abroad.

For all health care workers except housekeeping and laundry, the data collection instrument format was in English. But for the housekeeping and laundry workers the questionnaires translated to Amharic and later translated back to English, in order to maintain its consistency. Five percent of the sample was pre-tested in non-selected study hospital participants' in each health facility (public & private), before the actual data collection started.

The questionnaire was also designed to obtain information on socio-demographic characteristics data on the level of institution, department, age of the individual, sex, profession, educational status, years of service after the last graduation, knowledge and practice of the respondents.

Data were collected by two qualified health professionals (nurses trained on infection prevention and control). Adequate training was given for data collectors and supervisor (senior nurse), both before and after the pre test, on the objectives of the study, the contents of the questionnaire, issues related to the confidentiality of the responses and the rights of respondents. Data collection was conducted from April - May, 2009.

Various levels of HCWs were enrolled in the study. Physicians (n=66), nurses/midwifes (n=355), lab technicians (n=54), laundry personnel (n=63), housekeeping personnel (n=54), health officer (n=7) and others like environmental health, dental, etc (n=29). The answers were categorized into individual level and institutional level of hand hygiene practices, knowledge and program management of infection prevention

4.1.5.1. Measures and Study Variables

- Dependent/outcome/ variables
  - Hand hygiene practice
- Independent/exposure/ variables
  - The socio-demographic characteristics (age, sex, year of service, department, profession, level of health institutions and educational status).
  - Knowledge
  - Supplies
  - Hand washing facilities
  - Training

4.1.5.2. Operational Definitions

- *Antiseptic or antimicrobial agent (terms used interchangeably).* Chemicals that are applied to the skin or other living tissue to inhibit or kill microorganisms (both transient and resident) thereby reducing the total bacterial counts. Examples include alcohols (ethyl and isopropyl), dilute iodine solutions, iodophors, chlorhexidine and triclosan

- *Clean water.* Natural or chemically treated and filtered water that is safe to drink and use for other purposes (e.g., hand washing and medical instrument cleaning) because it meets specified public health standards.
- *Hand hygiene practice***.** Seven related questions were presented. HCWs wash there hands before examining a patient, before putting on sterile or high-level disinfected surgical glove, after handling soiled instruments and other, after touching mucous membranes, blood or other body fluids, after having prolonged and intense contact and after removing gloves.
- *Hand washing.* Process of mechanically removing soil and debris from the skin of hands using plain soap and water.
- *Health Care Workers.* Those health workers, who do have contact with syringes, needles, other sharp materials, blood and body fluids by the virtue of their duties.
- *Infection prevention.* Largely depends on placing barriers between a susceptible host (person lacking effective natural or acquired protection) and the microorganisms.
- *Knowledge.* Six knowledge questions were presented and correct answer was give score 1 and incorrect answer was give score 0. The sum was computed and those who scored above the mean were labeled as having 'good knowledge."
- *Multi-drug resistant pathogens.* Bacteria that cause serious infections that are very difficult to treat due to the pathogens' resistance to many commonly-prescribed antibiotics.
- *Nosocomial or hospital-acquired infection (terms used interchangeably).* Infection that is neither present nor incubating at the time the patient came to the healthcare facility. (Nosocomial refers to the association between

care and the subsequent onset of infection. It is a time-related criterion that does not imply a cause and effect relationship.)

- *Program management (IP) effort* were assessed using Likert scale method (1-strongly disagree, 2-disagree, 3-neither disagree nor agree, 4-agree and 5-strongly agree) and mean score fore each construct were computed and dichotomized into successful and unsuccessful. If respondent scores below the mean she/he would be labeled as having unsuccessful.
- *Transient* and *resident flora.* Terms that refer to where bacteria and other microorganisms are located in the layers of the skin.
- Transient flora is acquired through contact with patients, other healthcare workers or contaminated surfaces (e.g., examination tables, floors or toilets) during the course of the normal workday. These organisms live in the upper layers of the skin and are partially removed by washing with plain soap and clean water. They are the organisms most likely to cause nosocomial infections.
- *Resident flora* lives in the deeper layers of the skin, as well as within hair follicles, and cannot be completely removed, even by vigorous washing and rinsing with plain soap and clean water. Fortunately, in most cases, resident flora is less likely to be associated with infections. The hands or fingernails of some health workers, however, can become colonized in the deep layers with organisms that cause infections, such as *S. aureus,* gram-negative bacilli or yeast.
- *Visibly soiled hands.* Hands showing visible dirt or are visibly contaminated with blood or body fluids (urine, feces, sputum or vomit).
- *Waterless, alcohol-based antiseptic hands rub or antiseptic hands rub (terms used interchangeably).* Fast acting antiseptic hand rubs that do not require use of water to remove transient flora, reduce resident

microorganisms and protect the skin. Most contain 60–90% alcohol, an emollient and often an additional antiseptic (e.g., 2–4% chlorhexidine gluconate) that has residual action (Larson et al 2001).

4.1.6. Data Analysis

After the data collection, data entry was made by the principal investigator using EPI INFO version six statistical packages for each of the pre-coded questionnaire. Frequency output was used to check missing values and outliers and cleaning was done using original code number.

The data exported to SPSS version 17 statistical packages for further analysis. Descriptive statistics and summary measures were employed to the data. In order to investigate the association of dependent and independent variables and their degree of associations were computed the demographic, knowledge and program management of infection prevention variables with recommended hand hygiene practice and its determinant factors results using odds ratio (OR) and with 95% limit of confidence interval which were accepted as statistically significant. Then, to control the effect of confounding factors and assessed the separate effects of the variables, multiple logistic regression analysis was applied.

The six knowledge related questions were presented. Each of the fields was given a score and correct answer was given score one and incorrect answer was given zero. The sum was computed and those who scored above the mean were labeled as having ‘good knowledge’.

Program management was assessed using Likert scale method and mean score for each construct were computed and dichotomized into successful and unsuccessful program management of infection prevention effort. If respondents score below the mean she/he would be labeled as having unsuccessful. For hand hygiene practice followed the same procedure.

4.1.7. Quality control

The quality of data was assured through proper training of data collectors (to minimize systematic errors), close supervision, prompt feed back, having sufficient data to control internal validity and controlled confounding factors by using logistic regression analysis method.

Supervision was conducted by the principal investigator and a trained nurse. Supervisors checked for completeness of questionnaires every day. Incomplete questionnaires were returned to the data collectors the following day for correction by revisiting the participants. Re-interviewing some of the respondents randomly and crosschecked by recollection data from 5% of the study population.

The quantitative component of the study was self administered questionnaire & took 10 working days to collect data. The assurance of confidentiality delivered to improve the quality of data. Data consistency and completeness had been made not only during data collection but also all the way during data entry and analysis.

4.2.Qualitative method

4.2.1. Study design

For in-depth interview a qualitative semi-structured open-ended question was used. This instrument used as a guide during the interview to elicit relevant responses from the participants.

Sampling was purposive to include a range of characteristics that might reflect variation in management practices and in socio-demographic status of the respondents i.e. gender, age, profession, departments, educational level and years of work experiences were considered.

Probes and follow-up questions were supplemented through out the interview to facilitate the discussion to get consistent and complete responses.

4.2.2. Study population

The In-depth interview was focused on senior administrators, key institutions health professionals, and members of the infection prevention working groups/committees overseeing health safety, and practices.

The purpose of these interviews was to develop a firsthand understanding of the infection prevention program management (presence of guidelines, polices & distribution to health care workers, staff training, assignment of responsibilities, infection prevention supplies, decision making process and involvement of

professionals, planning and implementation of infection prevention and control, monitoring and feedback mechanisms) as well as the effectiveness of hand hygiene practices.

For this purpose a list of discussion questions was prepared partly from previous research materials in a form not dictate the direction of the interview. The participants were led in a way the interview, while the interviewer carefully crafts questions grounded in the participant's discourse.

4.2.3. Sampling and sample size

In order to obtain participants for the in-depth interview we made contact with the health facilities/departments heads and key institutions health professionals. Potential participants were contacted on the basis of two criteria for their involvement and participation voluntarily in the interview and currently working in the institution.

The key staff selected purposely for the interview. In total 17 key informants (almost half of them females) were interviewed face to face to reach saturation point of this study after which no new information or ideas was generated.

Fourteen interviews were tape-recorded while the rest three were dictated as these respondents were not willing on the use of a tape-recorder. The In-depth interviews were conducted by the principal investigator with the help of a well oriented infection prevention nurse trainer.

4.2.4. Interview procedure

Seventeen health care workers were interviewed at government and private health facilities. Using a standardized protocol that outlined the core questions, trained moderator/facilitator and the principal investigator were conducted the in-depth interview.

An open-ended semi-structured elicitation interview *instrument* was prepared based on the components of the infection prevention program management and hand hygiene. It was an emergent design.

Questions that were presented to the participants were about program management of infection prevention and control and hand hygiene related topics. Data was collected by the principal investigator and a well oriented infection prevention trainer nurse. Participants were told that there was no right or wrong answers and to deep the information discussed confidential.

4.2.5. Transcription of interview

Initially, all the in-depth interviews those audio - taped were transcribed verbatim and those dictated notes were expanded by principal investigator. Then, the transcribed statements and expanded notes were checked for accuracy against the original cassette recordings and notes.

4.2.6. Data analysis

All field notes were typed up using Microsoft word and were kept in files organizationally and by topic. The qualitative data (In-Depth interviews) was

registered and analyzed in the Open Code text based computer program which was developed by Umea University, Sweden.

The interview was coded line by line and concepts and categories were identified. All units of data (codes) referring to the main theme extracted and examined in more detail to find properties and dimensions. Categories and themes were modified and reduced by merging and linking them.

4.2.7. Reliability and validity

To ensure the validity and reliability of the data two qualitative research criteria were used: 1) Internal coherence and presentation of evidence whether the argument presented within a study internally consistence and supported by the data. 2) Of these, presentation of evidence refers to the publication sufficient quotations from participants' discourse to enable readers to evaluate the interpretation.

To maximize the credibility of the study, data collection and analysis process was continued until theoretical saturation was reached and conducted the negative case/outliers analysis (find explanations for a case, event that was different from others).

In addition, to avoid/minimize the possible interviewer bias, appropriate training was provided to the data collectors and the participants was given sufficiently longer time to build trust and get valid information. The validity of the findings was further enhanced through confidentiality; review of the transcripts, cross checking of the identified categories and themes by principal investigator.

4.3 **Ethical concerns**

University of Gondar department of community health research and publication committee as well as Addis Ababa Regional Health Bureau ethical committee provided ethical clearance for the study.

A written consent letter describing the purpose and benefits of the study was prepared and provided for each respondent to obtain their informed consents. They were also told that they can refuse the interview and that in the planed report or publication no individual identification will be given and their response would be confidential. Confidentiality was ensured through out the process.

To protect unauthorized access of information collected in the study, names were not stated and used a coding system.

5. RESULTS

5.1. Result of Quantitative Data

5.1.1. **Socio-demographic factors**

A total of 689 health care workers were invited [318 (46.8%) governmental and 371 (54.6%) private institutions] for the study, 628 [288 (45.8%), 340 (54.1%) respectively] completed the survey questionnaire yielding a response rate of 91.5%.

As it is shown in Table 2, the ages of respondents ranged from 19 to a maximum of 62 with a mean of 30.7 ± 8.6 years. 71.0% of (446) respondents were female. Distribution of level of education showed that more than three-fourth of the HCWs 498 (79.3. %) were diploma/certificate and above, degree holders constitutes 110 (17.5%).

The majority of participants were nurses/midwifes 355 (56.5%) followed by physicians 66 (10.5%), housekeeping personnel 63 (10.0), lab technicians 54 (8.6%), laundry personnel 54 (8.6%) and others (dental clinic and burn units) 29 (4.6 %). A three quarter of respondents' 472 (75.1%) years of service after the last graduation ranged from zero to ten years.

Table 1: Socio-demographic characteristics of respondents in Gov. and private hospitals, Addis Ababa, April – May, 2009.

Variables	Level of Institution	
	Gov. hospital [n=288 (45.9%)]	Private hospital [n=340 (54.1%)]
Department:		
Medical	46 (16.0%)	61 (17.9%)
Surgical	57 (19.8%)	43 (12.6%)
Pediatric	65 (22.6%)	43 (12.6%)
Laboratory	47 (16.3%)	86 (25.3%)
Gun/Obs	14 (4.9%)	39 (11.5%)
Supportive Staff	58 (20.1%)	68 (20.0)
Age group in years		
≤ 24	39 (13.5%)	105 (31.0%)
25-34	141 (49.0%)	179 (51.9%)
35-44	77 (26.7%)	32 (9.4%)
45-54	21 (7.3%)	20 (5.9%)
≥ 55	10 (3.3%)	6 (1.8%)
Sex		
Male	88 (30.6%)	94 (27.6%)
Female	200 (69.4%)	246 (72.4%)
Profession		
Physician	26 (9.0%)	40 (11.8%)
Health Officer	7 (2.4%)	0 (00.0%)
Nurses/Midwife	163 (56.6%)	192 (56.5%)
Lab. Technician	18 (6.3%)	36 (10.6%)
Laundry personnel	44 (15.3%)	10 (2.9%)
Housekeeping personnel	15 (5.2%)	48 (14.1%)
Others	15 (5.2%)	14 (4.1%)
Educational Status		
Primary school	16 (5.6%)	26 (7.6%)
Secondary school	28 (9.7%)	24 (7.1%)
High school	20 (6.9%)	12 (3.5%)
Diploma/certificate	175 (60.8%)	213 (62.6%)
First degree	21 (7.3%)	21 (6.2%)
Second degree & above	28 (9.7%)	40 (11.8%)
Years of service after the last graduation (years)		
6-10	52 (18.1%)	40 (11.8%)
11-15	29 (10.1%)	16 (4.7%)
16-20	49 (17.0%)	20 (5.9%)
≥ 21	26 (9.0%)	16 (4.7%)

5.1.2. **Hand hygiene practice**

The majority of health care workers wash their hands after removing gloves 558 (88.9%), after having prolonged and intense contact with a patient 533 (84.9%), after touching mucous membranes, blood or other 526 (83.8%), after having soiled instruments and other items 513 (81.7%), before examining a patient 485 (77.2%) and before putting on sterile or high-level disinfected surgical gloves 476 (75.8%).

After recoding & scoring of the results (Table 2) using SPSS package the over all recommended hand hygiene practice median score was 4.62 ± 1.945 out of seven variables/questions. The highest practice score to wards hand washing 4.96 ± 1.897 was by nurses/midwifes [n = 355 (56.5%)] followed by physicians and the least was by housekeeping personnel.

In order to determine what factors influence the infection prevention hand hygiene practice and investigate the association of selected variables with the result, both bivariate and multivariate analysis were used. Accordingly, as shown in Table 4, in the univariate analysis carried out between socio-demographic (level of institution, gender, profession, years of service after the last graduation), knowledge and infection prevention program management effort were found to be predictors of hand hygiene practice. It has been noticed that the difference was statistically significant by infection prevention program management effort ($P < 0.01$), level of institution, years of services after the graduation of respondents ($P< 0.005$) i.e. being private hospital, female, laboratory technician, nurses, laundry and housekeeping personnel, ≤ 5 years of service was significantly associated with the infection prevention hand hygiene practice.

Table 2: Hand hygiene practice of health care workers on selected variables, Addis Ababa, April –May, 2009.

Variables	Level of Institution		Total
	Gov. hospital [n=288 (45.9%)]	Private hospital [n=340 (54.1%)]	
Before examining a patient			
Yes	217 (75.3%)	268 (78.8%)	485 (77.2%)
No	71 (24.7%)	72 (21.2%)	143 (22.8%)
Before putting on sterile or high-level disinfected surgical glove			
Yes	188 (65.3%)	288 (84.7%)	476 (75.8%)
No	100 (34.7%)	52 (15.3%)	152 (24.2%)
After handling soiled instruments and other items			
Yes	233 (80.9%)	280 (82.4%)	513 (81.7%)
No	55 (19.1%)	60 (17.6%)	115 (18.3%)
After touching mucous membranes, blood or other body fluids			
Yes	232 (80.6%)	294 (86.5%)	526 (83.8%)
No	56 (19.4%)	46 (13.5%)	102 (16.2%)
After having prolonged and intense contact with a patient			
Yes	241 (83.7%)	292 (85.9%)	533 (84.9%)
No	47 (16.3%)	48 (14.1%)	95 (15.1%)
After removing gloves			
Yes	265 (92.0%)	293 (86.2%)	558 (88.9%)
No	23 (8.0%)	47 (13.8%)	70 (11.1%)

However, there was no statistically significant association with knowledge and IP hand hygiene practice. Laundry personnel were six times [OR = 6.69, (95% CI = 3.01-16.17)] more likely to perform the hand hygiene infection prevention practice than those with physicians.

There were also some interest to reanalyze the association between all variables together and the dependent variable (hand hygiene practice) of the study using a multivariate logistic regression. In this regard, as it can be noted from Table 3 that for socio-demographic characteristics that includes level of institution, gender, profession and IP program management were computed and have persisted to be significant predictors' of infection prevention of hand hygiene practice. The government hospitals HCWs 103 (35.8%) were practiced 1.6 times the recommended [1.61, 95% CI (1.09-2.40)] better than the private hospitals healthcare workers with $P < 0.05$.

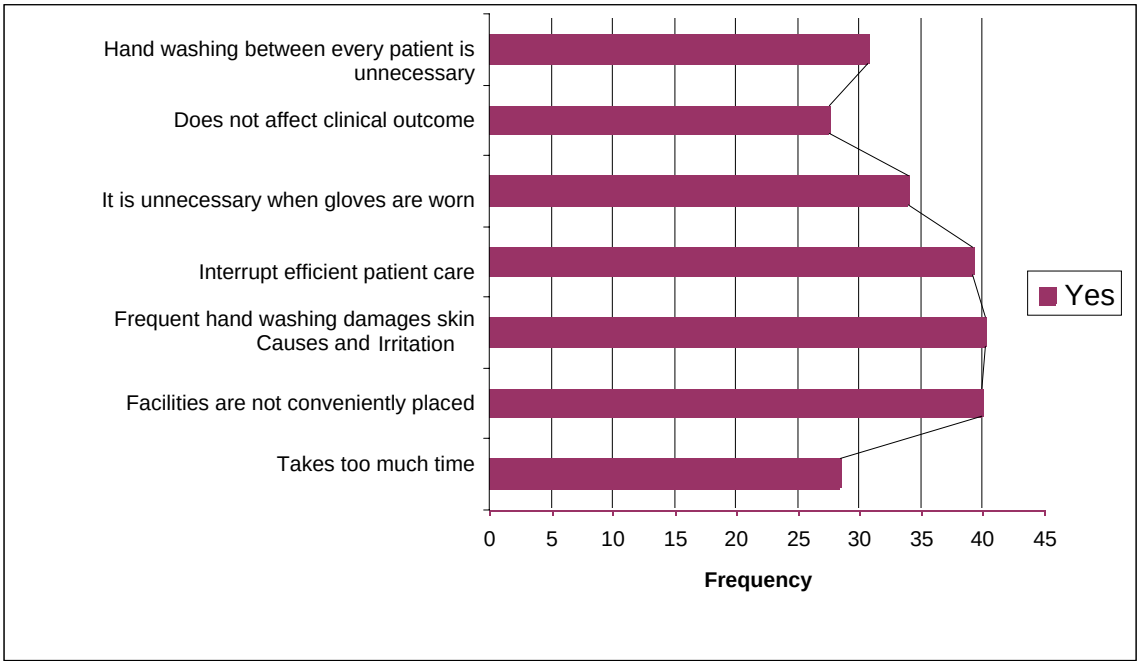
Table 3: Factors associated with infection prevention on hand hygiene practice in the government and private hospitals, Addis Ababa, April-May, 2009.

Characteristics N = 628	Not Recommended practice	Recommended practice	Total	Crude OR, (95% CI)	Adjusted OR, (95% CI)
Level of institution					
Government	185 (64.2%)	103 (35.8%)	288	1.0	1.0
Private	253 (74.4%)	87 (25.6%)	340	1.62, (1.15-2.28) **	1.61, (1.09-2.40) **
Gender					
Male	113 (62.1%)	69 (37.9%)	182	1.6, (1.14-2.36) **	2.46, (1.60-3.80) *
Female	325 (72.9%)	121 (27.1%)	446	1.0	1.0
Profession					
Physician	54 (81.8%)	12 (18.2%)	66	1.0	1.0
Health Offi.	3 (42.9%)	4 (57.1%)	7	6.00, (1.19-30-39) **	4.36, (0.80-23.80)
Nurse/midwife	263 (74.1%)	92 (25.9)	355	1.57, (0.81-3.07)	2.10, (1.02-4.33) **
Lab. Tech.	33 (61.1%)	21 (38.9%)	54	2.86, (1.25-6.57) **	2.73, (1.14-6.50) *
Laundry	20 (39.2%)	31 (60.8%)	51	6.96, (3.01-16.17) *	11.27, (4.42-28.74) *
Housekeeping	41 (62.1%)	25 (37.9%)	66	2.74, (1.23-6.10) *	4.36, (1.80-10.53) *
Others (dental, burn unit etc.)	24 (62.8%)	5 (17.2)	29	0.94, (0.30-2.96)	0.99, (0.30-3.21)
Years of service					
<= 5	255 (67.1%)	125 (32.9%)	380	1.57, (0.75-3.29)	2.73, (1.16-6.43) **
6 - 10	67 (73.6%0	24 (26.4%)	91	1.15,(0.49-2.68)	1.66, (0.65-4.25)
11 -15	34 (75.6%)	11 (24.4%)	45	1.04,(0.39-2.77)	1.52, (0.52-4.44)
16 - 20	49 (71.0%)	20 (29.0%)	69	1.31,(0.54-3.15)	1.55, (0.59-4.04)
>= 21	32 (76.2%)	10 (23.8%)	42	1.0	1.0
Knowledge					
Not knowledgeable	159 (70%)	68 (30%)	277	0.98, (0.69-1.395)	0.93, (0.63-1.34)
Knowledgeable	279 (69.6%)	122 (30.4%)	401	1.0	1.0
IP Program management effort n = 628					
Unsuccessful	265 (74.6%)	90 (25.4%)	355	0.589, (0.42-0.83) **	1.63, (1.15-2.31) **
Successful	173 (63.4%)	100 36.6.3%)	273	1.0	1.0

Ref. = Reference, *P<0.001, ** P<0.05

5.1.3. **Reasons Health Care Workers do not wash their hands**

Reasons reported by heath care workers that do not wash their hands include; hand washing between every patient is unnecessary 193 (30.7%), does not affect clinical outcome 173 (27.5%), it is unnecessary when gloves are worn 213 (33.9%), interrupt efficient patient care 246 (39.2%), frequent hand washing damages skin and causes irritation 252 (40.3%), hand washing facilities are not conveniently placed 232 (39.9%) and take too much time 179 (28.5%).



Graph 1: Reasons HCWs do not wash their hands April - May, 2009

The three most frequently reported reasons for not washing hands by level of institution were facilities are not conveniently placed; interrupt patient care, frequent hand washing damages skin and causes irritation.

5.1.4. **Knowledge of hand hygiene practice**

Table 4: Knowledge about infection prevention and control on selected variables, Addis Ababa, April - May, 2009

Variables	Level of Institution: Gov. hospital [n=288 (45.9%)]	Level of Institution: Private hospital [n=340 (54.1%)]	Total
Washing with soap and water			
Yes	277 (96.2%)	307 (90.3%)	584 (93.0%)
No	11 (3.8%)	33 (9.7%)	44 (7.0%)
Wash with chlorine (Burekina)			
Yes	132 (45.8%)	156 (45.9%)	288 (45.9%)
No	156 (54.2%)	184 (54.1%)	340 (54.1%)
Wash with alcohol or iodine			
Yes	195 (67.7%)	191 (56.2%)	386 (61.5%)
No	63 (32.3%)	149 (43.8%)	242 (38.5%)
Applying pressure to stop bleeding			
Yes	109 (37.8%)	163 (47.9%)	272 (43.3%)
No	179 (62.2%)	177 (52.1%)	356 (56.7%)
Squeezing to extract more blood			
Yes	135 (46.9%)	213 (62.6%)	348 (55.4%)
No	153 (53.1%)	127 (37.4%)	280 (44.6%)
Hand hygiene method best at killing bacteria			
Plain soap and water	23 (8.0%)	51 (15.0%)	74 (11.8%)
Antimicrobial soap and water	156 (54.2%)	195 (57.4%)	351 (55.9%)
Alcohol-based hand-rub	109 (37.8%)	94 (27.6%)	
It is acceptable for healthcare workers to supply their own lotions to relieve dryness of hands in the hospital.			
Strongly agree	116 (40.3%)	130 (38.2%)	246 (39.2%)
Agree	112 (38.9%)	117 (34.4%)	229 (36.5%)
Don't know	7 (2.4%)	23 (6.8%)	30 (4.8%)
Disagree	32 (11.1%)	48 (14.1%)	80 (12.7%)
Strongly disagree	21 (7.3%)	22 (00.0%)	43 (6.8%)
Healthcare-associated organisms are commonly resistant to alcohol.			
Strongly agree	34 (11.8%)	57 (16.8%)	91 (14.5%)
Agree	74 (25.7%)	68 (20.0%)	142 (22.6%)
Don't know	62 (21.5%)	80 (23.5%)	142 (22.6%)
Disagree	95 (33.0%)	95 (27.9%)	190 (30.3%)
Strongly disagree	23 (8.0%)	40 (11.8%)	63 (10.0%)
When a healthcare worker touches a patient who is colonized, but not infected with resistant organisms the HCW's hands are a source for spreading resistant organisms to other patients.			
Strongly agree	118 (41.0%)	120 (35.3%)	238 (37.9%)
Agree	83 (28.8%)	125 (36.8%)	208 (33.1%)
Don't know	40 (13.9%)	63 (18.5%)	103 (16.4%)
Disagree	32 (11.1%)	18 (5.3%)	50 (8.0%)
Strongly disagree	15 (5.2%)	14 (4.1%)	29 (4.6%)

Knowledge related questions were scored and 'knowledgeable' about infection prevention recommended hand hygiene practice was defined as a correct answer to more than the mean of nine knowledge related questions.

The highest hand hygiene practice knowledge score with maximum of 8 & minimum of 0 in the cut point of 5 in the study area with standard deviation of 1.381 was for physicians 5.95, followed by 5.62 others (e.g. environmental health, dental technicians etc), 5.29 laundry personnel, 4.98 lab technicians, 4.86 health officers, 4.74 nurses/midwifes and the least 4.35 housekeeping personnel. From socio-demographic characteristics, male had a better score 5.15 (n = 182) than female 4.71 (n = 446).

Based on the level of institution health care workers who were working in the government hospitals had a better knowledge score 5.20 (n = 288) compare to private hospitals sore 4.85 (n = 340) health care workers. But this was not statistically significant (Table 3).

5.1.5. **Infection Prevention and Control Program Management Effort**

When participants asked about the program management effort of the infection prevention and control activities, as shown in Table 5, 462 (73.6 %) of respondents said that there is a lack of suitable IP training, learning and development on offer, only 249 (39.6%) agreed that the managers try to involve staff in important infection prevention decisions, 219 (34.8%) also agreed managers/supervisors/ encourage staff to suggest new Infection Prevention (IP) ideas for improving practices.

Table 5: Program Management effort of Infection Prevention & Control of health care facilities, Addis Ababa, April-May, 2009

Variables	Level of Institution: Gov. hospital [n=288 (45.9%)]	Private hospital [n=340 (54.1%)]	Total
Lack of suitable IP training, learning and development on offer			
Yes	209 (72.6%)	253 (74.4%)	462 (73.6%)
No	79 (27.4%)	87 (25.6%)	166 (26.4%)
Managers here try to involve staff in important IP decision			
Strongly disagree	44 (15.3%)	64 (18.8%)	108 (17.2%)
Disagree	65 (22.6%)	86 (25.3%)	151 (24.0%
Neither disagree nor agree	64 (22.2%)	56 (16.5%)	120 (19.1%)
Agree	86 (29.9%)	51 (15.0%)	137 (21.8%)
Strongly agree	29 (10.1%)	83 (24.4%)	112 (17.8%)
Manager/supervisor/ encourage staff to suggest new IP ideas for improving practices			
Strongly disagree	41 (14.2%)	58 (17.1%)	99 (15.8%)
Disagree	76 (26.4%)	108 (31.8%)	184 (29.3%)
Neither disagree nor agree	73 (25.3%)	53 (15.6%)	126 (20.1%)
Agree	57 (19.8%)	45 (13.2%)	102 (16.2%)
Strongly agree	41 (14.2%)	76 (22.4%)	117 (18.6%)
Care of patients/service users is my institution priority			
Strongly disagree	74 (25.5%)	99 (29.2%)	173 (27.5%)
Disagree	94 (32.6%)	116 (34.1%)	210 (33.4%)
Neither disagree nor agree	58 (20.1%)	39 (11.5%)	97 (15.4%)
Agree	28 (9.7%)	21 (6.2%)	49 (7.8%)
Strongly agree	33 (11.5%)	65 (19.1%)	98 (15.6%)
If I were a patient of this health facility, I would be happy with the standard of care provided.			
Strongly disagree	64 (22.2%)	77 (22.6%)	141 (22.5%)
Disagree	96 (33.3%)	143 (42.1%)	239 (38.1%)
Neither disagree nor agree	61 (21.2%)	57 (16.8%)	118 (18.8%)
Agree	30 (10.4%)	17 (5.0%)	47 (7.5%)
Strongly agree	37 (12.8%)	46 (13.5%)	83 (13.2%)
The institution does enough to promote the importance of hand washing to staff.			
Strongly disagree	37 (12.8%)	75 (22.1%)	112 (17.8%)
Disagree	69 (24.0%)	118 (34.7%)	187 (29.8%)
Neither disagree nor agree	63 (21.9%)	49 (14.4%)	112 (17.8%)
Agree	68 (23.6%)	47 (13.8%)	115 (18.3%)
Strongly agree	51 (17.7%)	51 (15.0%)	102 (16.2%)
The institution does enough to promote the importance of hand washing to patients, service users and visitors.			
Strongly disagree	35 (12.2%)	92 (27.1%)	127 (20.2%)
Disagree	85 (29.5%)	104 (30.4%)	189 (30.1%)
Neither disagree nor agree	77 (26.7%)	51 (15.0%)	128 (20.4%)
Agree	49 (17.0%)	54 (15.9%)	103 (16.4%)
Strongly agree	42 (14.6%)	39 (11.5%)	81 (12.9%)
Infection control applies to me in my role.			
Strongly disagree	52 (18.1%)	83 (24.4%)	135 (21.5%)
Disagree	161 (55.9%)	122 (35.9%)	283 (45.1%)
Neither disagree nor agree	44 (15.30%)	47 (13.8%)	91 (14.5%)
Agree	16 (5.6%)	37 (10.9%)	53 (8.4%)
Strongly agree	15 (00.0%)	51 (15.0%)	66 (10.5%)

Program management effort of infection prevention and control were assessed using Likert scale method and mean score for each construct were computed and dichotomized into successful and unsuccessful management. If respondent scores below the mean she/he would be labeled as having unsuccessful. The majority of respondents [355 (56.5. %) answered that the infection prevention and control program management effort of the health facilities was unsatisfactory. This was statistically significant (P = 0.002) and associated with infection prevention of hand hygiene practice [(Crude, OR = 0.89, 95% CI = 0.92-0.83), (Adjusted OR = 1.63, 95% CI = 1.15-2.31), P = 0.05].

5.2. Result of Qualitative Study (summary results of In-depth interview):

Eight principal themes were identified which consisted of health care workers views.

Table 6: Summary of Qualitative Findings.

No.	Themes identified (consisted of health care workers views)	Major findings
1	Availability of written guidelines, polices, their dissemination & conducting of an initial IP assessment	▪ The majority of respondents from gov. hospitals were aware of the existence of guideline, less positive about the distribution. ▪ Participants from private institution appeared to be less familiar with the national IP guideline. ▪ Very few respondents indicated about engagement of institutional leadership about infection control assessment and action.
2	Staff training, learning or development opportunities	▪ One of the area substantial shortfalls in the health care facilities. ▪ Very few health facilities provided IP training mainly governmental. Recording of adherence, training effectiveness was not strong. ▪ Respondents articulated the need for better training opportunities.
3	Availability and adequateness of infection prevention supplies, equipment and facilities	▪ Most of them identified key IP products and supplies ▪ But it was compounded by shortage of IP materials ▪ Private hospitals are in better position by providing IP materials in comparison with the governmental ▪ Weak follow-up mechanism of materials mainly government hospitals ▪ Lack of hand washing facilities and water for hand washing practice

4	Assignment of responsibilities/presence of IP working group with related to infection prevention and control activities	▪ Absence of IP working group in the private hospitals Presence of non-functional IP committee in some governmental hospitals
5	The decision making process and communication mechanism and degree of involvement of HCWs	▪ Most of the participants said that there was no substantial involvement of staff in the decision making process ▪ Poor communication mechanisms among staffs, management bodies and clients
6	Planning & implementation of infection prevention and control program	▪ Most of the facilities yet to develop written IP and control plan. Few of them attempted with out effect
7	Monitoring mechanism of IP practices and follow-up of training effectiveness and need	▪ Most of the facilities were not made this strategy a priority ▪ In few of governmental hospitals there were attempts to establish a monitoring mechanism using a checklists but with out continuity ▪ They believe that the Business Process Reengineering (BPR) affects the progress
8	Availability of feedback and reward mechanism	▪ Claimed that there was no strong personal or group feedback mechanism. In most of the institutions there was no suitable rewards offered in the form of either incentives or verbal acceptance

5.2.1. **Availability of written guidelines, dissemination & initial infection control assessment.**

The investigation showed that the majority of respondents from government hospitals were aware of the existence/availability of written guideline/procedures established to handle in which patients or staffs are exposed to the risk of infection. However, they were less positive about the distribution to the health care workers. GAM1*:* One manager from Gov. Hospital said that *"I can say that the last two years we have got different kinds of infection prevention guidelines including the national one from local and international organizations, for in stance Jhpiego, Clinton foundation (NGO) and we adopted the guidelines for our purposes."* But in the distribution of guidelines; "*even though there were a good start, here there were gaps, we were started distributing with out doing substantial progress. For the last several months we have been very focused on Business Process Reengineering (BPR").* GDF2**:** *We have also the blue print policy of infection prevention protocol* (national guideline). *All the fourteen infection prevention committee members have got the guideline and including the HIV protocol. But I'm not sure if all health care workers have this guideline.*

According to most private institution, participants appeared to be less familiar with the national infection prevention protocol, PF3: *We do not have guidelines for infection prevention; there are health professionals that we got training on infection prevention. In turn we provided training for the rest of the health care workers including housekeeping personnel.*

When asked if there was an initial infection control assessment was done very few respondents indicated that the hospital leadership are actively engaged and leading the

change against infections in their facilities. GF9: one of the participants from governmental hospital responded "*Yes, we did an assessment once (July 2000 E.C). By using a check list to see whether the IP program was working or not including hand washing. We compiled the results and presented to the management committee of the institution for decision and for purchasing the materials, but that were not happened and there was no additional assessment. The management committee was decided twice to purchase the IP materials based on the assessment result but there was no visible action with this regard."*

5.2.2. **Staff training, learning or development opportunities:**

Responses to the interviewee indicate that this is one of the areas where substantial shortfalls are occurring in the health care facilities. Very few number of health facilities mainly governmental have provided training to workers on widely accepted recommended infection prevention and control. While training and communication among staff, hospital leadership, patients and their families and other plan elements are significantly inadequate in most surveyed facilities. Almost all respondent articulated the need for better training opportunities, integration and for improving support mechanisms for health care workers including housekeeping and laundry personnel. PF10: *Before I came here I was working in other private hospital I participated in doing infection prevention assessment. There was small number of training opportunities, only few people got the training. There should be for every health care workers example housekeeping personnel. Those people are exposing for contamination. They should know how to handle sharp materials. Those who have got training should also support and train the others. In the past we planned to conduct IP training but not implemented. Every body should assist this work including physicians, head nurses and managers.*

According to the participants most of the trainings were provided by non governmental organization (such as JHPIEGO, Clinton foundation) in collaboration with Ministry of Health and Hospital trainers.

Recording of adherence, training effectiveness or incidents by individual health workers and departments as part of an annual evaluation was not strong. Infection prevention and control head from the government hospital suggested that (GM4 :) *"Yes we tried to keep records specifically in the office of Matron but currently based on the new hospital reorganization there is no matron position. This means no more records. We were requesting to include matron in the new hospital structure."*

5.2.3. **Assignment of responsibilities with related to IP**

To identify and bring together key hospital staff to form infection prevention working group or committee if one has not been established, one of government hospital environmental health professional responded GF3: *"Yes, we established infection prevention working group last year and assigned roles and responsibilities for every member of the committee. For in stance the responsibility of environmental health, responsibility of the surgeon, responsibility of housekeeping personnel, responsibilities of nurses, pharmacies and laboratory personnel. But now committee is no more functional because of hospital reorganization, commitment and other reasons."*

Department head nurse from the private hospital said PF9: *"We do not have an infection prevention training opportunities and we never thought establishing IP committee. We do not have infection prevention working group. I'm responsible for*

this department and I'm member of the management body. I prepared IP training for my subordinates they are practicing based on this on job training."

5.2.4. **Availability, adequateness of IP supplies, equipment & facilities**

Most of the respondents have identified key infection prevention products and supplies that are essential to provide protection from disease transmission, but it was compounded by shortage of IP materials. It seems that private hospitals are in better condition by providing IP materials relatively in comparison that of public health facilities. GF5: *"The problem was that most of them* (management members & health professionals) *are giving priority not for prevention but case management. Prevention and hygiene is not our culture we preferred treating cases rather than preventing. I think this is one of the main reasons. For instance, during the time of budget allocation every body due attention to purchase drugs not IP materials. Prevention should be our culture. We have been learnt in the school that 80% of our burden of disease is preventable. There should be a behavioral change in this regard, to do so infection prevention education should be provided in the school and make it our culture. In the health facilities adequate supplies should be available."*

With related to follow-up mechanism whether the necessary equipment and supplies are available and being used properly. From the Gov. Hospital IP member said (GM8 :) *"Yes most of the time we collect information from departments and tried to estimate even the cost of the materials. We were using a routine mechanism for follow-up whether the necessary equipment and supplies were available and being used properly for in stance through department heads, infection prevention committee sometimes informal visits. But because of inflation the service materials became expensive and this somehow affects the process and it is a challenge. The hospital*

budget is not adequate to cover the needs. As the result of budget deficit and lack of maintenance most of the water sinks are not functional. Because of budget deficit we are using alcohol based hand hygiene. The department of pharmacy was informed to supply enough amount of alcohol solution. Unfortunately, we observed in appropriate use of alcohol solution by the health professionals that also some how contributed for the shortage. Now some how staff attitude is better than before."

5.2.5. **Decision making process, communication and involvement of HCWs**

Under the involvement of staff in the key decision making process on infection prevention and control practice theme, most of the participants said that there was no substantial involvement of health care workers in the decision making process of the hospitals. GF1: "*The health care workers are not participating in the decision making process. But the environmental health professional prepare the necessary supplies or equipment lists for every department. For example the maternity ward sink and latrine is not functional it requires maintenance and I presented to the medical director and the medical director accept the issue and forwarded to the administrator & finance head to take the appropriate action. The administrator & finance head forwarded to his subordinate to general services for action. The general service office said we do not have budget and put it the paper in his office with out taking action."* (Sign of frustration).

With related to communication mechanisms among staffs, management bodies and clients; member of governmental institution nurse answered that; GM1: *"I never saw the management committee communicating with staff members. If there is an issue it is presenting in the meeting and decides. I didn't see that it reaches to staff members. As I told you earlier if there is a need of supply or maintenance it presenting to the*

management bodies through the environmental health professional. If patients have problems they present their complaint informally to the responsible body to get solution other wise there is no formal communication channel with staff – management bodies or patients.

5.2.6. **Planning and Implementation of Infection Prevention & control Program**

Most of the facilities have yet to develop written infection prevention and control plan for responding to potential communicable disease few of them attempted with out effects. In the absence of such a plan, healthcare facilities will be hard pressed to provide the comprehensive response required to address the exposure risks that workers will encounter when providing care for infected patients. *Yes we tried. The hospital leaders told us to prepare the plan because it was the requirement for budget request from the ministry of health. We prepared the proposal including the estimated cost of all the necessary supplies unfortunately, it remained on paper work it was not implemented. The reason given was as usual there was no budget. In general, for infection prevention practice purpose budget was not allocated. Every year the hospital management members are preparing a budget plan but IP is not part of their plan unless receive money from other activities. For this reason we stop planning.*

Among facilities that do have written plans, the majority of respondent reported that they or their members were not involved in assisting in developing infection prevention plans and procedure for how to address health and safety issues. Most of the reported reasons for poor hand hygiene practice were certain ones are clearly associated with the, institution or system (e.g. absence of proper infection prevention planning, lack of institutional priority for hand hygiene, administrative sanctions, a

safety climate, non functional water sinks and inadequate supplies). Most of these reasons would require a system change in the majority of institutions.

5.2.7. **Monitoring mechanisms of IP practices & training**

Regular monitoring mechanisms of IP practices and process to assess the effectiveness and to determine the topics about which staff may need more training or review for better compliance of health care workers and providing them with frequent feedback on their performance to improved hand hygiene practices most health facilities were not made this strategy a high priority. GM12: *We were using the check lists and we following-up the standard based management and recognition on infection prevention of the institute. This is the standard* (displaying the document) *which was prepared by JHPIEGO and has 25 components. The first is about internal assessment we can see our base line then by providing education we can assess the second and third assessment. We have done infection prevention assessment. The result showed that there was improvement immediately after the training and some time we observed worsening of the situation. We saw changes immediately after the training and gradually declining. Some of the reasons of declining were lack of supplies, equipment and consistent follow-up. There is also negligence from the HCWs side e.g. not flushing the needle and syringe three times in the 0.5 chlorine solution after infection. They presented as a reason lack of time.*

To have long-term effects regarding the importance of maintaining an infection-free environment for safer delivery of services the initial training follow-up head nurse form government hospital said that (GM3:) *"The infection prevention team was led by the surgical department specialist (surgeon) had been monitored the effectiveness of*

the training and practices. But currently because of reorganization it is not monitored properly."

5.2.8. **Feedback & Reward mechanism**

Some of the respondents claimed that they did not receive any personal or group feedback from their respective institutional leadership. The study shows that health workers overall are strongly guided by their professional conscience and similar aspects of related to ethos. In fact, many health workers are frustrated precisely because they are unable to satisfy their professional conscience and impeded in pursuing vocation due to lack of proper monitoring, feedback support and due to inadequate supplies. PM11: *We can not say there is a proper mechanism to provide feedback except that informally trying to encourage staff to continue their good work.*

According to the majority of the participants, there were no suitable rewards offered for those who complied in the form of either incentives or verbal acceptance, seniors did not comply and therefore it was quite natural that the new recruits did not feel the importance to comply and also that the institution had not made hand hygiene agents and proper hand washing facilities available head nurse from the private hospital said that (*PF13*:) *Here it is a private hospital. They might pay you better money by increasing your salary to motivate you otherwise there is no a reward mechanism especially with related to infection prevention.*

Although most interviewee share the above comments about the reward mechanism where as few of the health care workers indicating that; GF2: *Yes, there are role models, for example the maternity ward head nurse is our role model she is very supportive of the activities. She is also member of the infection prevention committee.*

We selected their ward as a role model and to encourage them we provided them from the donated personal towel. We provided them also a feedback (verbal). But recently even the committee is not functional. Because there is no change, every time we meet decide something was not implemented every body frustrated. Now I'm alone they are not coming to the meeting. Infection prevention & control practice should be taken seriously. There must be a behavioral change. We should start education from the school to have a desired change. But currently in this condition it is very difficult to make change.

6. DISCUSION

In this study, level of institution, gender, profession, years of service after the last graduation and infection prevention program management effort were found to be predictors of hand hygiene practice. Nurses/midwifes and laboratory technicians respondents were about 1.6 & 2.9 times more likely to practice hand hygiene than physicians and this was significantly associated in logistic regression analysis. The government hospitals healthcare workers were practiced the recommended hand hygiene practice 1.6 times better than the private hospitals with $p < 0.05$. This can be explained by that the public hospital health professionals had better training opportunities on infection prevention.

As to the knowledge of respondents about infection prevention hand hygiene practice, 63.9% (401) had greater or equal to the mean score. This study indicated that healthcare workers have comparatively a better knowledge than the previous study done in North Wollo (45.5%). More than half of the respondents (56.5%) answered that the infection prevention and control program management effort of the health facilities was unsatisfactory. This was also supported by the findings of qualitative individual in-depth interview and only few respondents indicated about engagement of institutional leadership (public & private) in support of infection prevention and control program management.

According to respondents factors that have contributed to poor hand hygiene practice including a lack of knowledge among personnel about the importance of hand hygiene in reducing the spread of infection and how hands become contaminated, lack of understanding of correct hand hygiene technique, understaffing and overcrowding, lack of institutional commitment to good recommended infection prevention practice,

in adequate water supplies and non functional water sinks. At the group level the barriers to practice hand hygiene was attributed to lack of education, planning and implementation of infection prevention practice and lack of encouragement which was compounded by shortage of budget.

The majority of respondents were less positive about the degree to which their organizations encouraged and support them to practice the recommended infection prevention and control measures. They felt that the program was not discussed adequately with staff, and that infection prevention was not discussed regularly or in sufficient depth at staff meetings or on job trainings. Furthermore, respondents said that they were not fully informed of the nature and causes of incidents, although they would like to have had training opportunities.

Official monitoring of compliance with the precautions was also considered insufficient. By contrast, in few departments of the institutions follow-up from colleagues was judged to be better. Preventing infections primarily involves education linked to behavior change interventions. Staff not only needs to have correct information regarding risks and know how to avoid risks, but also they need to have appropriate risk-averting behavior demonstrated.

In addition, with infection prevention, as with any clinical area, numerous situations arise where tough decisions have to be made, weighing the advantages of a certain procedure against the possible risks to the patient or healthcare worker, this decisions must be practical and consistent and, as much as possible, should be based on scientific evidence. In making these decisions, managers' often must strike a balance between the importance of the problem and providing acceptable levels of safety for specific healthcare tasks which not found to be in most health institutions studied.

In Ethiopia, there are few studies conducted on infection prevention or related topics. Findings of poor practice of hand washing on busy days were seen and it is also in line with the finding of Engender health and Nigat project in Addis Ababa as health care workers do not usually wash hands on arrival to workplace and before putting on glove (6).

A study done in North Wollo Zone, in Ethiopia revealed that the overall hand hygiene adherence rate was 28.34%. Correct hand hygiene practice has statistically significant association with availability of water, alcohol, and participating in universal precautions trainings. According to the above study, the mean knowledge score of health care workers was 2.53 ± (SD 1.17) and 156 (44.6). Where as, the mean knowledge score of health care workers in our study was 4.94 (SD 1.381) and 401 (63.9%) of respondents had greater or equal to the mean score (7).

As shown in studies else where, the value of easy access to hand hygiene supplies, whether sink, soap, medicated detergent, or waterless alcohol-based hand rub solution, is self explanatory. Asking busy health-care workers to walk away from the patient bed to reach a wash basin or a hand antisepsis solution invites noncompliance with hand hygiene recommendations (23).

A study done in university of Geneva hospital on practice of the hand washing rate range 23 to 87% and the overall doctor's compliance rate were 57% (26). Healthcare workers are aware that pathogens may be transmitted from one patient to another or from patient to health care providers while caring for the patient. For nearly 150 years it has been shown that hand hygiene before and after contact with a patient or contaminated environment is the most effective measure of preventing contamination

as it has been shown in many studies that increasing compliance decreases hospital infection rates.

Studies have shown that at least one third of all hospital infections are preventable. A substantial proportion of infections results from cross-contamination, and transmission of microorganisms by the hands of health-care workers is recognized as the main route of spread. Lack of scientific information on the definitive impact of improved hand hygiene on hospital infection rates has been reported as a possible barrier to adherence with recommendations. This finding was supported by our results (27)

As Kretzer and Lason (25) revisited; the complex dynamic of behavioral change involves a combination of education, motivation, and system change, various psychosocial parameters influencing hand hygiene behavior include intention, attitude toward the behavior, perceived social norms, perceived behavioral control, perceived risks of infection, habits of hand hygiene practices, perceived model roles, perceived knowledge, and motivation, factors necessary for change include dissatisfaction with the current situation perception of alternatives, and recognition, both at the individual and institutional level, of the ability and potential to change. While the latter implies education and motivation, the former two necessitate primarily a system change.

This study has provided pertinent information about infection prevention focused on the recommended hand hygiene practice and the program management of infection prevention and control for public health professionals, healthcare workers and decision makers. It will also will improve the quality of health services and decrease the disease transmission cycle as result safe human life and limited resources.

7. STRENGTHS AND LIMITATIONS OF THE STUDY

7.1. Strengths

- The strength of this study includes; in recognition of the dual role of infection prevention not only in reducing the risk of disease transmission to clients and patients but also protecting health care workers at all level-from physicians and nurses to cleaning and housekeeping staff, this study will provide important information which will be direct operational and public health importance countries like Ethiopia with limited resources.

- In order to minimize the study error, measures have been taken since the beginning of this study:
  - By developing appropriate action plan as objective outcome rather than subjective
  - Samples collected randomly
  - Developing a well defined criteria for identifying a proper case
  - Developed a well defined criteria for identifying a proper cases
  - Used a multivariate statistical analysis method to correct the interference of 3rd factors.
- Consideration of a design effect and high non-response rate during sample size determination to maximize the sample in order to improve validity of the study was strength.
- Utilization of both quantitative and qualitative research method and comparison made
- Inclusion of all health care workers in the study, randomization and stratification.

7.2. Limitations

- ☞ The result of this survey might be biased due to:
    - o "Chicken or egg" dilemma (cross-sectional study)
    - o Recall or social desirability,
    - o Selection,
    - o Misunderstanding the purpose of in-depth interview and failure to give complete answer
    - o Exaggeration and dishonesty about the infection prevention on hand hygiene practice of HCWs and program management effort of managers/supervisors.

- ☞ Surgical hand-scrub which is one of the components of hand hygiene practice wan not covered fully.

8. CONCLUSION & RECOMMENDATION

8.1. Conclusion

- The results indicate that healthcare facilities have made some efforts in practicing the recommended infection prevention hand hygiene program, but much more needs to be done if our health care system is to respond successfully to a serious communicable disease with serious consequences.

- In our view, the finding they a substantial proportion of the facilities surveyed lack a comprehensive infection prevention plan, adequate supplies, infection prevention working group, involvement of healthcare workers in key decision making process and lack proper recommended hand hygiene practice.

- From the results of the study we have also drawn conclusions that an effective IP program management effort and institutional leadership, training opportunities on hand hygiene practice activities will help in the retention of knowledge, attitudes and practices among the various categories of HCWs.

8.2. Recommendations

- The health authority should utilize its existing mechanisms already in place and take action to assist employers and workers in the healthcare system in implementing its existing recommended hand hygiene practice (national guideline).

- Most of the reported reasons would require program management and commitment (written guidelines, staff training, planning, a regular system monitoring adequate supplies etc), visible safety programs and acceptable level of work stress, a tolerant and supportive attitude toward reported problems and belief in efficacy of preventive strategies.

- Commitment also by all stakeholders, such as front-line staff, managers and healthcare leaders in general, institutional leadership is a key determinant of success (public and private health facilities) including adoption of an alcohol-based hand rub as the primary method for hand hygiene and use of performance indicators.

- Observational study on recommended hand hygiene.

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